Shock Propagation and Banking Structure*

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Abstract

We conjecture that lenders' decisions to provide liquidity are affected by the extent to which they internalize any spillover effects of negative shocks. We show that lenders with a larger share of the loans outstanding in an industry are more likely to provide credit to industries in distress with less redeployable assets, in which fire sales are more likely to ensue. Lenders with a large share of outstanding loans are also more likely to provide liquidity to customers and suppliers of industries in distress, especially when the disruption of supply chains is expected to be more costly. Our results provide a novel channel, unrelated to market power, explaining why concentration in the credit market may favor financial stability.

JEL classification: E23, E32, E44, G20, G21, L14

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1 Introduction

Interconnections between different firms and industries are known to lead to the propagation of shocks throughout the economy in a way that can drive aggregate fluctuations (Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012)). This paper argues that the extent to which cascade effects due to interconnections propagate depends on the structure of the banking system and the lenders' share of the loans outstanding in an industry.

Our argument is the following. Negative shocks and industry distress often lead to asset fire sales. Through this channel, negative shocks affecting one borrower may deplete the balance sheets of other firms in the same industry (Lang and Stulz (1992)). Shocks may also ripple through the supply chain (Hertzel, Li, Officer, and Rodgers (2008); Barrot and Sauvagnat (2016)), magnifying the initial shock to the industry in distress through the disruption of input demand and supply. Ultimately, these spillover effects are expected to adversely affect the lenders of the industry in distress not only because the propagation of shocks may impair the value of the loans they have retained, but also because it may disrupt future business with firms in the distressed industry.

Lenders anticipate that fire sales and cascade effects along the supply chain are less likely to ensue if they directly or indirectly provide liquidity to firms affected by large negative shocks and distress. We hypothesize that a lender's decision to provide liquidity depends on the extent to which the lender internalizes any adverse spillover effects of negative shocks. Lenders with a larger share of the loans outstanding in an industry in distress are aware that liquidity provision mitigates fire sales and supply-chain disruptions. Providing liquidity may, in turn, enable them to preserve future business. High-market-share lenders may thus be more inclined to provide credit in times of distress.

We find that lenders that have a large share of the loans outstanding in an industry in distress are more likely to initiate new loans to firms in that industry, especially if the industry is prone to fire sales, as proxied by the presence of industry-specific assets. We also find that lenders that are prominent providers of credit to an industry in distress are more

likely to extend credit to firms upstream and downstream. These effects are largely driven by industries in which firms have strong relationships with their customers and suppliers. In particular, by propping up the distressed industry's customers, lenders may help to boost the sales of the distressed (upstream) industry, thereby mitigating fire sales and increasing borrowers' ability to repay their loans.

Lenders also provide credit to suppliers of distressed industries. Suppliers are more likely to experience negative liquidity shocks if downstream firms make late payments or default on their obligations. As a consequence, they may experience distress and even failure (Boissay and Gropp (2013), Jacobson and von Schedvin (2015)). However, suppliers' financial health and continued provision of inputs and other products are important for the performance of their customers (Bernard, Moxnes, and Saito (2015); Barrot and Sauvagnat (2016)), especially if they are in industries with strong relationships along the supply chain.

Overall, high-market-share lenders' liquidity provision along the supply chain stabilizes distressed industries. As we show, following distress, industries in which loan provision is more concentrated experience fewer bankruptcies. In addition, we find that these industries enjoy better long-term stock-market performance, which suggests that banks' lending behavior is indeed efficient.

We document a number of cross-sectional effects, which are consistent with the causal mechanism underlying our maintained hypothesis. We document that banks are significantly more likely to lend to customers of distressed industries if such customers are less leveraged than firms in the distressed industry. In this manner, banks generate liquidity for their borrowers in the distressed industry without unnecessarily further increasing their leverage. We also find that banks lend more to customers of distressed industries if these customers are highly concentrated, while they provide less credit to these customers if the distressed industries themselves are highly concentrated. Banks thus optimize the extent to which they internalize the externalities created by financial distress along the supply chain by focusing on strategically important firms.

All of our results are obtained after absorbing bank-level supply and industry-level de-

mand shocks using bank-time and industry-time fixed effects, respectively. Thus, our estimates capture the differential propensity of banks that are important to an industry to provide new loans in case of distress. We mitigate any lingering concerns that a lender's market share may be spuriously correlated with the lender's propensity to grant new loans by exploiting exogenous variation in industry market shares due to bank mergers similarly to Favara and Giannetti (2016) and Garmaise and Moskowitz (2006). The results of these tests support the causal interpretation of our findings.

We also investigate alternative mechanisms that may lead to our findings. For instance, one may wonder whether a lender's share of the loans outstanding in an industry captures the exposure of the lender's portfolio to the industry (i.e., the industry's share of the bank's loan portfolio). As Acharya, Hasan, and Saunders (2006) and Loutskina and Strahan (2011) show, less diversified lenders may be better informed. Therefore, our measure of a lender's share of the outstanding loans in an industry could be related to an informational advantage, which may explain the lender's willingness to extend loans to borrowers in distressed industries.

While we do not deny that better information may enable lenders to internalize externalities, an explanation based on portfolio concentration and information asymmetry alone cannot account for the cross-sectional effects that we find. First, we find no evidence that a lender's portfolio exposure to an industry, a common indicator of banks' expertise, positively affects its propensity to extend new loans to borrowers connected to industries in distress. In addition, if lenders only had an informational advantage, they would not necessarily be more inclined to provide liquidity to industries prone to fire sales, such as industries with more fixed assets. This is because the presence of fixed assets would imply a lower degree of information asymmetry to begin with. Finally, we document that lenders provide liquidity to new customers in distressed industries, not only to the customers that they engaged with in the recent past and for which they are expected to have a greater informational advantage.

Our paper is related to several strands of literature. First, we contribute to the banking literature. Existing work focuses on the effect of bank and relationship characteristics in the transmission of economic shocks. Typically, foreign banks are believed to be fickle lenders

(Giannetti and Laeven (2012)), while a close relationship with a bank guarantees stable funding when negative shocks occur (Bolton, Freixas, Gambacorta, and Mistrulli (2016); Liberti and Sturgess (2016)). We recognize that bank lending decisions may feed back to lenders' balance sheets through the health of related borrowers, and that some lenders – notably banks with a high fraction of the loans outstanding in an industry – may take into account these feedback effects in their lending decisions.

This point is related to Favara and Giannetti (2016) who show that lenders that have retained a high fraction of outstanding mortgages are more likely to renegotiate and, thus, mitigate the effects of negative shocks on real estate prices. To the best of our knowledge, we are the first to recognize that the internalization of externalities may affect lending decisions to distressed industries and along the supply chain.

Our paper also relates to the literature that explores the effects of bank loan concentration on bank-firm relationships (Berger, Miller, Petersen, Rajan, and Stein (2005)), loan supply (Garmaise and Moskowitz (2006)), and the transmission of monetary policy to mortgage rates (Scharfstein and Sunderam (2016)). All of these papers study the effects of market power on loan contract terms. We focus, instead, on the role of concentration of the loans outstanding in an industry on lenders' incentives to provide liquidity during distress, a mechanism unrelated to market power. By showing that concentrated lenders are more prone to provide liquidity, we also present an alternative interpretation to the view that competition in the credit market erodes financial stability because it distorts lenders' risk-taking incentives by lowering their profit margins (Keeley (1990)).

Finally, we contribute to the literature on forced sales of real and financial assets (Shleifer and Vishny (1992), Shleifer and Vishny (2011)). Forced asset sales may reduce the value of collateral and impair the balance sheets of other borrowers (Benmelech and Bergman (2011)). Our paper shows that when industry conditions are poor, certain lenders are more inclined to extend new loans, potentially mitigating the initial effects of forced asset sales.

2 Data Description and Variable Definitions

This section describes the construction of the dataset and the most important variables in our analysis. Our main data source is DealScan, which comprises transaction-level data on syndicated loans. We focus on all completed syndicated loans issued to publicly listed or privately held U.S. firms. While our most comprehensive sample period is $1990 - 2013$, in most of our tests we focus on the period from 1997 to 2013, because we are able to identify relationships over the supply chain starting only from 1997. As is customary, we drop all public-service, energy and financial-services firms, and identify bank-industry lending relationships by focusing on the lead arrangers of syndicated loans. We hand-match each lead arranger to its respective bank-holding company.

We measure bank lending as the dollar amount of loans for which a bank serves as lead arranger. Since our objective is to explore whether a lender j's exposure to an industry i affects the lender's propensity to provide credit to firms in that industry at time t, we aggregate data at the bank-industry-time level ijt.

The main reason for aggregating the loan-level information is that, as we will show, changes in the loan supply are mainly driven by changes in the number of loans that are issued. Thus, changes in the total amount of loans that are extended are a better proxy for changes in the supply of credit than changes in the amount of each loan that has been granted. We aggregate the data at the half-year frequency, allowing us to capture time-varying industry conditions without inflating the number of observations in which a bank issues no syndicated loans to a particular industry. Using six-month periods also allows lenders to react to industry conditions as it typically takes several months to issue a syndicated loan.

To detect industry distress, we consider historical industry stock returns. Building on Dinc, Erel, and Liao (2015), we define $\textit{Industry distress}_{it-1}$ as a binary variable that takes the value of one if industry i experienced a cumulative average stock return of less than -10% in the previous half-year $t-1$.

Our conjecture is that banks' incentives to internalize potential externalities derive from

their share of the loans outstanding in an industry in distress. We define *Market share*$_{ijt-2}$ as the proportion of bank j's total loan volume granted to industry i over the aggregate loan volume of industry i. Both the bank's and the industry's loan volumes are measured over the previous six years (that is, the previous six-month periods from $t-13$ to $t-2$), because syndicated loans' maturity is, on average, six years.

We contrast a bank's market share in an industry to the share of an industry in a bank's loan portfolio. The difference between *Portfolio share of industry*$_{ijt-2}$ and *Market share*$_{ijt-2}$ is the denominator. We define the former to be equal to the proportion of bank j's total loan volume to industry i over the aggregate loan volume granted by bank j over the previous six years.

To focus on banks that have an interest in an industry, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years.[1] If a lender that satisfies this condition does not issue any loan to an industry in a six-month period, we include the observation as a zero-loan observation. Thus, our dataset comprises 28 observations (for each half-year from the first half of 1997 to the second half of 2013) for each bank-industry pair.

In order to test our maintained hypothesis that banks with a larger market share internalize any externalities created by financial distress, we also consider customer and supplier relationships. We identify customer-supplier relationships at the industry level using input-output tables from the U.S. Bureau of Economic Analysis (BEA), because contagion effects are known to spread beyond reliant suppliers and major customers to firms in their respective industries (Hertzel, Li, Officer, and Rodgers (2008); Carvalho, Nirei, Saito, and Tahbaz-Salehi (2016)). The BEA provides annual tables for the use of commodities by industries, before redefinitions (producers' prices), for 71 summary industries for the period from 1997 to 2013, which constrains our sample period. We match the information from the BEA's input-output tables with information about borrower firms in the DealScan database. To do so, we translate the BEA's industry codes to SIC codes, available for each borrower

[1] Results would be similar if we included all bank-industry pairs, but this would yield a larger number of zeros in our dataset.

in DealScan, using a conversion table attained from the BEA.[2]

For each one of the 71 BEA industries, we identify suppliers and customers of an industry as the top supplier and customer industries, respectively, other than the industry itself. To explore banks' liquidity provision over the supply chain, we measure supplier and customer distress as well as a lender's market share in the industries of the main suppliers and customers using variables defined analogously to *Industry distress*$_{it-1}$ and *Market share*$_{ijt-2}$. We refer to these variables as *Supplier distress*$_{it-1}$, *Customer distress*$_{it-1}$, *Supplier share*$_{ijt-2}$, and *Customer share*$_{ijt-2}$.

We differentiate industries along a number of dimensions. First, we conjecture that if banks indeed internalize externalities arising from industry distress, they should have stronger incentives to initiate new loans if the industry is prone to fire sales. This is more likely to be the case in industries with less redeployable assets. We use two alternative measures of asset specificity.

Our first measure follows Kung and Kim (2016), who use the 1997 BEA capital-flow table which breaks down expenditures on new equipment, software, and structures by 180 assets for 123 industries. We define *Specific*$_i$ as a time-invariant indicator for whether the industry in question is among the bottom-quintile industries in terms of asset redeployability. In addition, we define a second proxy for asset specificity, *Specific (alternative)*$_{it}$, as a time-varying indicator for whether the industry in question is among the top-quintile industries in terms of its ratio of machinery and equipment to total assets in year t. This proxy is widely used in the literature to capture asset redeployability and to measure how prone an industry is to fire sales (see Acharya, Bharath, and Srinivasan (2007)).

Second, high-market-share banks' incentives to initiate new loans to customers and suppliers of industries in distress should depend on the extent to which customers and suppliers entertain close relationships, as defaults and other problems may cause larger costs in these industries due to the disruption of valuable relationships. To capture this empirically, we use the list of industries in Cremers, Nair, and Peyer (2008). We define *Relationship industries*$_i$

[2] https://www.census.gov/eos/www/naics/concordances/concordances.html

as an indicator for whether industry i and its customer or supplier industry are relationship industries. The intuition behind this classification, described in detail by Cremers, Nair, and Peyer (2008) and widely used in the literature, is that in industries that sell durable goods, firms are likely to interact repeatedly with their trade partners to provide maintenance and service. Any interruption of these services is expected to cause large costs.

Summary statistics. In Table 1, we present summary statistics for our main variables. After merging the BEA input-output tables with industries borrowing in the syndicated-loan market, as recorded in DealScan, our sample includes 57 industries and 211 banks. Each industry, on average, obtains credit from 44 banks, whereas each bank, on average, covers 12 industries. Overall, our sample includes a total of 2,516 bank-industry relationships.

Our bank-industry-half-year structure includes observations associated with zero loans issued in an industry. We find that 22.5% of the 82,986 observations are associated with non-zero loans. In the whole sample, banks' market share of a given industry, its supplier, or customer is 2%.[3] There is, however, large variation in lenders' market shares, and some industries have a unique lender in certain periods. On average, *Portfolio share of industry*$_{ijt-2}$, *Portfolio share of supplier*$_{ijt-2}$, and *Portfolio share of customer*$_{ijt-2}$ are somewhat higher, as the denominator is replaced by the aggregate loan volume granted by bank j.

Finally, our industry-distress indicator variables imply that 20 to 22% of all observations are associated with industry-level shocks.

3 Empirical Methodology

We next discuss our empirical strategy for identifying the effect of industry-level shocks on banks' lending decisions along the supply chain. Our objective is to test whether banks with a large market share in an industry are more inclined to extend loans to the industry, its suppliers, or its customers if said industry experiences distress.

[3] Note that the number of observations for *Market share*$_{ijt-2}$, *Supplier share*$_{ijt-2}$, and *Customer share*$_{ijt-2}$ varies because we consider observations for which the denominator of these shares is zero as missing.

Our main outcome variable of interest is the total loan volume that an industry attains from a bank in period t. Alternatively, we also use an indicator variable for whether a bank grants any loan to an industry in period t. More concretely, we consider how the total loan volume of industry i received from bank j in half-year t varies depending on bank j's previous market share in either industry i itself, in its main suppliers' industry, or in its main customers' industry. In particular, we are interested in the effects of bank j's market share following industry distress at $t-1$. Our baseline regression specification is:

$$y_{ijt} = \beta_1 \textit{Market share}_{ijt-2} \times \textit{Industry distress}_{it-1} + \beta_2 \textit{Market share}_{ijt-2} + \mu_{ij} + \theta_{it} + \psi_{jt} + \epsilon_{ijt},$$

where y_{ijt} denotes an outcome variable related to the total loan volume granted to industry i by bank j at time t; $\textit{Market share}_{ijt-2}$ is bank j's market share of loans in industry i at time t; $\textit{Industry distress}_{it-1}$ is an indicator variable for whether industry i was in distress in the previous period $t-1$; and μ_{ij}, θ_{it}, and ψ_{jt} denote bank-industry, industry-period, and bank-period fixed effects, respectively.

In particular, θ_{it} captures all time-varying unobserved heterogeneity of an industry, including an industry's demand for loans.[4] ψ_{jt} captures all time-varying unobserved heterogeneity across banks, such as shocks to credit supply or other bank-level changes. Standard errors are clustered at the bank level.

The coefficient of interest is β_1, which reflects to what extent banks' previous market share in a given industry increases their propensity to grant new loans to *the same* industry after it enters distress. By replacing $\textit{Market share}_{ijt-2}$ by $\textit{Supplier share}_{ijt-2}$ or $\textit{Customer share}_{ijt-2}$, and $\textit{Industry distress}_{it-1}$ by the corresponding indicators of distress in suppliers' and customers' industries, β_1 measures banks' propensity to lend to the customers and suppliers of a shocked industry, respectively.

Our empirical framework, by absorbing any supply shocks affecting bank j and any demand shocks affecting industry i, allows us to identify the differential propensity of bank j

[4] Industry-period fixed effects naturally also subsume $\textit{Industry distress}_{it-1}$.

to lend to industry i in distress (or its customers and suppliers) using as control other banks with different market shares in the same industry i, as well as bank j's propensity to lend to other industries that are not in distress in which bank j has a similar market share. Our fixed-effects structure allows us to exclude a wide range of alternative explanations, which could lead to a spurious correlation between a bank's market share and its lending decisions. In Section 4.3, we introduce an instrumental-variable methodology to further address such concerns.

4 Main Results

We now turn to our estimation results. First, we present evidence on bank lending to industries in distress, differentiating between industries with high and low asset specificity. Then, we consider banks' ability to internalize potential externalities from industry distress over the supply chain.

4.1 Bank Lending to Distressed Industries

Table 2 tests whether lenders that over the past six years provided a larger share of an industry's loans are more inclined to lend to this industry when it experiences distress. Panel A shows that banks with a large market share generally extend more loans. This tendency, however, is drastically accentuated during periods of industry distress.

This evidence is consistent with the idea that banks with a large market share in an industry provide liquidity to internalize the externalities of financial distress. However, bank-firm relationships could be closer in industries with higher loan concentration. Relationship banks could in turn be more inclined to lend to their old clients in distress, even if they do not internalize any externalities. To evaluate the merit of this alternative explanation, in Panel B, we repeat the same set of tests as in Panel A, excluding any loans granted by banks that have issued a syndicated loan to a firm over the previous six years.

For this purpose, we re-define the dependent variables to comprise only loans to firms in industry i to which bank j *did not* lend in the previous six years. The remaining loans are unlikely to have been granted to borrowers with a close relationship with bank j. However, it still appears that banks with a higher market share issue more loans to borrowers in distressed industries. This evidence does not support a mechanism based on close relationships between banks and firms. Together with a battery of tests that we present in the rest of the paper, it rather supports the view that banks with a high share of loans outstanding in an industry internalize the externalities of financial distress.

The estimates in Panels A and B rely on the sample of loans from 1990 to 2013. However, as explained in Section 2, the BEA's input-output tables are available only from 1997 to 2013. Thus, the tests in which we identify the main supplier and customer industries have to rely on this shorter sample. Panel C re-estimates all models in Panel A and shows that our main results hold in this shorter sample. The results are generally robust to the sample used, and are not only statistically but also economically significant. In column 1 of Panel C, increasing a bank's market share by one standard deviation (0.052) increases the volume of new loans by 32% ($= 0.052 \times 6.135$) following industry distress.

This effect does not depend on the fact that certain banks lend more than others, as we include bank-period fixed effects throughout the analysis. The effect is also not driven by industries in distress borrowing more, as the result is robust when we include industry-period fixed effects in column 2. The coefficient of interest on the interaction term *Market share*$_{ijt-2}$ $\times$ *Industry distress*$_{it-1}$ remains significant even after additionally controlling for bank-industry fixed effects (column 3). The parameter estimate of the interaction term capturing the propensity of banks with different market shares to lend to industries in distress is reduced, but it still implies a highly significant 13% ($= 0.052 \times 2.468$) increase in the propensity to lend following a one-standard-deviation increase in *Market share*$_{ijt-2}$. From hereon, we use the most conservative specification in column 3 – with bank-industry, bank-period, and industry-period fixed effects – as our baseline regression specification.

Across all three panels of Table 2, the higher propensity of banks with large market shares

to lend to industries in distress appears to be driven entirely by new loans to industries. To capture this, we use as dependent variable an indicator capturing any new loans granted to industry i by bank j during period t (column 5). In contrast, the effect on individual loan amounts, computed as the logarithm of the average loan size, is not significant (column 4). Our findings suggest that, on average, lenders with high market shares do not grant larger loans when an industry is in distress in comparison to normal times.

The economic mechanism that we propose is that high-market-share banks' higher propensity to grant loans to industries in distress is motivated by their desire to avoid potential externalities stemming from defaults and asset fire sales. We do not deny that banks may know better the industries in which they have higher market shares. While their knowledge may be a prerequisite to lend in times of distress, we argue that banks are more inclined to lend if negative shocks may cause externalities. Table 3 provides more direct evidence on our proposed mechanism. We re-estimate the specifications of the third and fifth column of Table 2, differentiating between industries with different propensities to fire sales.

Asset sales are more likely to result in fire sales in industries in which assets are less redeployable, as potential buyers in the same industry may be financially constrained when the industry is in distress. Consistent with our maintained hypothesis, we find that high-market-share banks' propensity to grant new loans to industries in distress increases in industries' asset specificity. This is indicated by the positive and significant coefficient on the triple-interaction term in Table 3. The results are consistent when we use as alternative proxies for asset specificity either an industry's low level of asset redeployability in the first two columns or an industry's high ratio of asset specificity, computed as machinery and equipment relative to the industry's assets, in the last two columns.

Importantly, since industries with high fixed assets are less subject to asymmetric-information problems, these results indicate that the effect of a bank's market share on loan provision following an industry's distress is unlikely to be driven by the bank's informational advantage.

4.2 Bank Lending to Customers and Suppliers of Distressed Industries

Externalities generated by financial distress are not confined to a given industry, but can also spread over the supply chain. Supply-chain disruptions may have negative feedback effects on the balance sheets of lenders that are highly exposed to (customer) industries in distress. Firms in distress are likely to default on their suppliers, potentially leading to further defaults. The spreading of financial problems to upstream industries may worsen the problems of industries in distress, as firms are highly dependent on their suppliers. Therefore, high-market-share lenders may have an incentive to extend new loans to the suppliers of industries in distress in an attempt to limit the propagation of the initial shock and to avoid negative feedback effects on their balance sheets.

Table 4 presents supporting evidence for this conjecture. In column 1, we find that banks that have a large market share in an industry (customer) in distress are more likely to grant new loans to the suppliers of that industry. The magnitude of the coefficient on *Customer share*$_{ijt-2}$ × *Customer distress*$_{it-1}$ is even larger than the corresponding coefficient in column 3 of Table 2. As in Table 2, the effect is driven entirely by new loans to the industry, i.e., the extensive margin (in column 3) rather than the intensive margin (in column 2).

Importantly, this result does not depend on the fact that distress is transmitted from customers to their suppliers, and that banks with a large market share in the customers' industry also have a large market share in upstream industries. In columns 4 and 5, we control for *Market share*$_{ijt-2}$ × *Industry distress*$_{it-1}$ to capture this effect. The magnitude of the coefficient on *Customer share*$_{ijt-2}$ × *Customer distress*$_{it-1}$ is invariant and remains highly statistically significant.

High-market-share lenders may also be inclined to extend new loans to distressed industries' customers in order to prop up the demand for their clients' products and to increase their ability to repay their loans. To test this, in Table 5, we re-estimate all specifications from Table 4, but replace *Customer share*$_{ijt-2}$ and *Customer distress*$_{it-1}$ by *Supplier*

$share_{ijt-2}$ and *Supplier distress*$_{it-1}$. The results confirm that banks with a large market share in an industry (supplier) in distress grant new loans to its customers.

Also, the internalization of externalities over the supply chain does not appear to depend on the correlation of banks' market shares in upstream and downstream industries. In columns 4 and 5, where we additionally control for *Market share*$_{ijt-2}$ $\times$ *Industry distress*$_{it-1}$, the magnitude of the coefficient on *Supplier share*$_{ijt-2}$ $\times$ *Supplier distress*$_{it-1}$ remains invariant, even though in column 4 the coefficient is not statistically significant at conventional levels, with a p-value of 11%.

Lenders' incentives to internalize externalities stemming from financial distress along the supply chain should be stronger in industries in which firms maintain long-term relationships with their trade partners, as these are likely to be hard to replace. We classify industries that provide durable goods or services as industries in which trade partners are more likely to establish long-term relationships following Cremers, Nair, and Peyer (2008). Therefore, any externalities caused by financial distress should be more severe if both the distressed industry and its upstream or downstream industry are relationship industries.

We conjecture that the effect of lenders' market shares on new loans to the suppliers and customers of industries in distress should be larger in relationship industries. In Table 6, we find that this is indeed the case: in columns 1 and 2, the tendency of high-market-share lenders to provide credit to the suppliers of industries in distress is highest when both customers and suppliers are in relationship industries. Columns 3 and 4 show a similar tendency for the customers of industries in distress.

4.3 Exploiting Bank Mergers as a Source of Variation in Market Shares

To address the concern that banks' lending decisions may be driven by time-varying unobserved heterogeneity correlated with previous market shares, we explore whether our results are robust to using exogenous variation in market shares. To construct instruments, we use a

methodology similar to Favara and Giannetti (2016) and Garmaise and Moskowitz (2006). In particular, we exploit mergers between banks that are active in the syndicated-loans market.

We detect mergers between any two banks in our DealScan loan data using the SDC M&A database in conjunction with any mergers that we identify through a LexisNexis news search. Our instrument for *Market share*$_{ijt-2}$ is defined to be equal to 0 until the period t immediately preceding the completion of the merger of bank j with another bank k, and equal to the sum of the two merging banks' market shares in industry i in $t-2$ thereafter. Table 7 displays the first-stage results, and shows that our instruments are highly statistically significant. There are therefore no concerns about our instruments being weak.

In the first column of Table 8, we re-run the specification from the third column of Panel C in Table 2. Similarly, in the second and third column, we re-run the specifications from the first column of Tables 4 and 5, and instrument *Customer share*$_{ijt-2}$ and *Supplier share*$_{ijt-2}$ using merging banks' market shares in industry i's customer and supplier industries, respectively. All three treatment effects are robust to using this instrumental-variable approach. The effects are significant at the 7%, 17%, and 6% level in the first, second, and third column, respectively. Interestingly, only the estimated coefficient on *Supplier share*$_{ijt-2}$ $\times$ *Supplier distress*$_{it-1}$ increases compared to the OLS estimate (in the first column of Table 5).

4.4 To Which Customers Do Banks Extend New Loans?

In the following tests, we explore the strategic dimension of banks' decision to extend new loans to distressed industries' customers. First, banks may decide to lend to a distressed industry or to its customers in order to maximize the effectiveness of their liquidity provision and at the same time to minimize costs arising from financial frictions and credit risk. For instance, extending new loans to an industry in distress may be particularly costly if such an industry already has high leverage, because situations of debt overhang may arise. In this case, indirectly providing liquidity to customer industries, which would increase their input purchases, may be optimal from a lender's point of view. To explore this, we re-run the first

three specifications of Table 5, and add an interaction term with *Relative leverage*$_{it}$, which is a ratio comparing the leverage of an industry's suppliers with the (customer) industry itself.

Our estimates in the first column of Table 9 show that high-market-share banks' tendency to lend to the customers of an (upstream) industry in distress is more pronounced if the industry in distress has high leverage in comparison to the customer industry. By providing loans to the customers, lenders can increase the sales in a distressed industry and, thus, provide liquidity without having to further increase its leverage and the financial frictions associated with high debt. As before, the effect is driven by the extensive margin (in column 3) rather than the intensive margin (in column 2).

In Table 10, we provide further evidence for the strategic nature of banks' decisions to provide credit to customers of distressed industries. Namely, we document that banks with high market shares are more likely to extend new loans to the customers of an industry in distress if these customers are highly concentrated (Panel A). In this case, one or few loans are likely to generate large sales for the distressed upstream industry, while in dispersed customer industries many loans may be necessary, increasing lenders' cost of limiting contagion. Conversely, lenders are less likely to provide credit to customers if the distressed upstream industry is highly concentrated (Panel B), as in this case lenders can limit contagion cost-efficiently by providing few loans upstream.

In summary, our evidence suggests that banks optimize their efforts to internalize externalities along the supply chain by focusing on strategically important customers.

5 Alternative Interpretations

In the following, we discuss competing explanations for our findings, in particular the possibility that our findings may reflect banks' differential degree of diversification and the competition they face in the credit market following industry distress.

5.1 Bank Diversification

So far, we have interpreted the effect of *Market share*$_{ijt-2}$, *Customer share*$_{ijt-2}$, and *Supplier share*$_{ijt-2}$ to depend on banks' ability to internalize externalities. However, banks' market shares in distressed industries may also be correlated with their informational advantage in extending loans to said industries.

Table 11 explores whether patterns similar to the ones we have highlighted so far emerge when we use a bank's *Portfolio share*$_{ijt-2}$, which is a proxy for the extent to which a lender's portfolio is exposed to a given industry. This measure is considered to be positively correlated with banks' informational advantage in extending loans to an industry (Acharya, Hasan, and Saunders (2006); Loutskina and Strahan (2011)).

After re-estimating the regression specification in the third column of Table 2 as well as the ones in the first column of Tables 4 and 5, we find that *Portfolio share*$_{ijt-2}$ does not positively affect the extension of new loans to borrowers in distressed industries, nor to their suppliers and customers. This further corroborates the idea that our findings are driven by lenders' tendency to internalize the externalities associated with distress, and that the effects are tied to the proportion of loans outstanding in an industry rather than to banks' degree of diversification.

5.2 Bank Competition

Alternatively, lenders' propensity to support industries in distress could also be related to competition in the credit market. Banks may be more inclined to support industries in distress if they earn, or anticipate to earn, higher rents in the future. The first two columns of Table 12 explore whether *Market share*$_{ijt-2}$ captures varying degrees of competition for credit in (distressed) industries, by relating our variable of interest to two measures of the average cost of loans in the respective industries.

In the first column, we use as outcome variable the logged average all-in-drawn spread of

all loans granted to industry i by bank j 12 months after the industry shock. In the second column, we use as an alternative measure the total cost of borrowing, defined as in Berg, Saunders, and Steffen (2016). Wilner (2000) argues that lenders may subsidize industries in distress in order to earn rents in the future. Therefore, in the last two columns, we also test whether the loan spread on future loans is higher when lenders have a high market share and the industry has experienced distress in the past 24 months, rather than 12 months.

In the first and third column of Table 12, we do not find any evidence that loan spreads increase following credit provision to industries in distress. However, high-market-share lenders appear to charge higher total cost of borrowing, suggesting that these banks have economic incentives to lend to industries in which they have a larger market share, albeit not differentially so in times of distress versus normal times (columns 2 and 4). Thus, it does not appear that lenders' propensity to support industries in distress is driven by their desire to extract even higher rents in the future. More generally, these results suggest that banks with higher market shares are more likely to provide loans to borrowers in industries in distress, but they do not alter the spread on these loans.

6 Real Effects

To evaluate the economic consequences of the patterns in bank lending that we highlight in this paper, we examine whether a higher concentration of outstanding loans in an industry alleviates the consequences of distress. As we have shown that banks' lending behavior across the supply chain aims to avoid potential externalities from industry distress, we conjecture that distress in industries with a high credit concentration is less likely to be associated with adverse real outcomes, such as bankruptcies.

To test this, we run industry-level regressions at the half-year frequency, and use as dependent variable an indicator for whether there have been any delistings in industry i in period t. As before, we use as explanatory variable an indicator for industry distress, *Industry distress*$_{it-1}$. In addition, we define a measure of credit concentration, *Market HHI*$_{it-2}$, as

the Herfindahl index of the banks' market shares in industry i over the previous six years, that is, from $t-13$ to $t-2$, analogously to *Market share*$_{ijt-2}$. This measure of concentration varies between 0 and 1, with a higher value indicating higher concentration in the provision of loans to an industry.

In the first column of Table 13, periods of industry distress are associated with a 20-percentage-point increase in the probability of industry-wide delistings. However, this effect is attenuated in industries with a high credit concentration, as the coefficient on the interaction between *Market HHI*$_{it-2}$ and *Industry distress*$_{it-1}$ is negative and significant. After including industry fixed effects in the second column, this coefficient remains robust. Conversely, the previously negative coefficient on *Market HHI*$_{it-2}$ becomes insignificant, possibly because credit concentration does not vary considerably within industries over time.

The attenuating effect of credit concentration on industry delistings following distress is not only statistically but also economically significant. A one-standard-deviation increase in *Market HHI*$_{it-2}$ of 0.124 (see last row in Table 1) corresponds to a decrease in the likelihood of industry-wide delistings by $0.124 \times 0.341 = 4.23$ percentage points following industry distress, a large effect considering that the probability of delisting is 0.304 in our sample.

As delistings are longer-term consequences of industry distress, in the fourth and fifth column, we double the horizon of our dependent variable from six months to one year after industry distress. The coefficients on the interaction term are virtually unaltered.

As an additional robustness check, in the third and sixth column, we use the market share of the top lender in industry i over the past six years as an alternative measure of concentration. Our results remain largely robust (although the coefficient in the third column is significant only at the 14% level).

Fewer delistings in distressed industries could allow so-called zombie firms to survive, and may actually decrease an industry's overall performance, as highlighted by Caballero, Hoshi, and Kashyap (2008). To evaluate whether the behavior of high-market-share banks is efficient in the sense that it does not help zombie firms to survive, we investigate whether

the long-run abnormal performance of industries following distress is related to the level of credit concentration.

To this end, we adopt a calendar-time-portfolio approach (see Fama (1998)), using monthly industry stock returns. We build two types of portfolios: industries in distress that are in the top vs. bottom quintile of the distribution in terms of the industry-level credit concentration over six years prior to distress, as captured by *Market HHI*$_{it-2}$. We estimate industry performance (alpha) using weighted least squares with weights that account for the fact that monthly returns with more industries entering the respective portfolio are more precisely estimated than months with fewer industries (see Malmendier, Opp, and Saidi (2016)).

Table 14 displays the long-run abnormal returns (alpha in % per month) over three, five, and seven years for the two types of portfolios in the first two columns. Most importantly, the alpha estimate in the last column reflects the long-short difference of a portfolio that is long in the top quintile of the credit-concentration distribution, and short in the bottom quintile.[5]

We find that industries in distress generally experience negative abnormal returns in the long run, but significantly less so if they have high levels of credit concentration (column 3). The long-short difference amounts to $0.336\% \times 12 = 4.032\%$ per annum over three years. After seven years, the long-short difference remains positive, at $0.243\% \times 12 = 2.916\%$ per annum.

This evidence complements our findings in Table 13, suggesting that industries with a high credit concentration experience fewer delistings following industry distress, and that the surviving stocks indeed outperform those in distressed industries with a low credit concentration. Thus, the behavior of banks in industries with a high concentration of outstanding loans appears to be efficient overall and to improve industry performance.

[5] Note that the alpha estimate in the third column is generally not exactly equal to the difference between the alpha estimates in the first and second column, because the number of industries in a given portfolio month is not constant across the two portfolios, for which we account by weighting observations as indicated in Appendix A of Malmendier, Opp, and Saidi (2016).

7 Conclusion

In this paper, we argue that lenders' propensities to provide liquidity are affected by the degree to which they internalize potential feedback effects of negative shocks. We show that lenders with a larger share of the loans outstanding in an industry in distress are more likely to provide credit, especially if the industry has less redeployable assets, as fire sales are likely to ensue in case of firm defaults. Lenders with a larger share of outstanding loans are also more likely to provide loans to suppliers and customers of industries in distress, and particularly so when the disruption of supply chains is expected to be more costly.

Our results show that the concentration of outstanding loans impacts to what extent industry shocks are transmitted along the supply chain and become systemic. In this respect, we present evidence of a new channel, unrelated to market power, for why concentration in the credit market may enhance financial stability.

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8 Tables

Table 1: **Summary Statistics**

Bank-industry-half-year level	Mean	Std. dev.	Min	Max	N
Number of bank-industry pairs					2,516
Number of industries					57
Number of banks					211
Loan volume in 2015 $bn	0.375	2.090	0.000	102.715	82,986
Any loan $\in \{0, 1\}$	0.225	0.418	0	1	82,986
Market share $\in [0, 1]$	0.021	0.052	0	1	82,986
Supplier share $\in [0, 1]$	0.022	0.053	0	1	47,072
Customer share $\in [0, 1]$	0.022	0.053	0	1	52,404
Portfolio share of industry $\in [0, 1]$	0.052	0.145	0	1	73,200
Portfolio share of supplier $\in [0, 1]$	0.044	0.095	0	1	42,436
Portfolio share of customer $\in [0, 1]$	0.029	0.067	0	1	47,263
Industry distress $\in \{0, 1\}$	0.216	0.412	0	1	82,986
Supplier distress $\in \{0, 1\}$	0.202	0.401	0	1	47,072
Customer distress $\in \{0, 1\}$	0.209	0.406	0	1	52,404
Specific $\in \{0, 1\}$	0.196	0.397	0	1	82,986
Specific (alternative) $\in \{0, 1\}$	0.163	0.369	0	1	76,712
Relationship industry $\in \{0, 1\}$	0.500	0.500	0	1	82,986
Avg. spread in bps ($\neq 0$)	259.640	150.383	1.5	1,480	18,479
Avg. total cost of borrowing in bps ($\neq 0$)	146.259	125.791	4.732	949.594	8,326
Market HHI ($1990 - 2013$)	0.171	0.124	0	1	2,633

Notes: *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over the past six years (i.e., twelve half-year periods from $t-13$ to $t-2$). *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over the past six years (i.e., twelve half-year periods from $t-13$ to $t-2$). *Customer share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume in industry i's customer industry, measured over the past six years (i.e., twelve half-year periods from $t-13$ to $t-2$). *Portfolio share of industry*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume granted by bank j, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Portfolio share of supplier*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume granted by bank j, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Portfolio share of customer*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume granted by bank j, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's supplier industry was less than -10% in the previous half-year $t-1$. *Customer distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's customer industry was less than -10% in the previous half-year $t-1$. *Specific*$_i$ is is an indicator for whether industry i is among the bottom 20% industries in terms of asset redeployability, as defined in Kung and Kim (2016). *Specific (alternative)*$_{it}$ is an indicator for whether industry i is among the top 20% industries in terms of its ratio of machinery and equipment to total assets in year t. *Relationship industry*$_i$ is an indicator for whether industry i is a relationship industry, as defined in Cremers, Nair, and Peyer (2008). Spread refers to the all-in-drawn spread. The total cost of borrowing is from Berg, Saunders, and Steffen (2016). *Market HHI*$_{it-2}$ measures the credit concentration in industry i over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$, across all banks that provide credit to industry i in the sample described in Table 13.

Table 2: **Bank Lending to Industries in Distress**

	ln(1+Loan volume)			ln(Avg. loan size)	Any loan
Sample	All	All	All	Loan vol. $\neq 0$	All
Panel A: Regression sample from 1990 to 2013					
	(1)	(2)	(3)	(4)	(5)
Market share × Ind. distress	4.942***	3.562***	2.177**	-0.186	0.117***
	(1.288)	(0.956)	(0.855)	(0.230)	(0.045)
Market share	8.293***	12.581***	4.806***	-0.199	0.217***
	(1.613)	(1.269)	(0.923)	(0.375)	(0.049)
Industry distress	-0.087				
	(0.065)				
Bank-industry FE	N	N	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	N	Y	Y	Y	Y
N	113,494	113,470	113,470	24,292	113,470
Panel B: Regression sample from 1990 to 2013, no relationship loans					
	(1)	(2)	(3)	(4)	(5)
Market share × Ind. distress	3.712**	3.381**	2.650**	-0.021	0.140**
	(1.453)	(1.495)	(1.245)	(0.608)	(0.066)
Market share	21.712***	21.014***	11.400***	-1.989***	0.634***
	(3.745)	(3.527)	(2.832)	(0.395)	(0.145)
Industry distress	0.006				
	(0.066)				
Bank-industry FE	N	N	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	N	Y	Y	Y	Y
N	59,444	59,425	59,412	11,026	59,412
Panel C: Final regression sample from 1997 to 2013					
	(1)	(2)	(3)	(4)	(5)
Market share × Ind. distress	6.135**	4.302**	2.468*	0.150	0.130**
	(2.595)	(1.900)	(1.267)	(0.241)	(0.064)
Market share	7.881***	14.609***	-0.774	-0.764*	-0.055
	(2.842)	(1.683)	(1.469)	(0.414)	(0.073)
Industry distress	-0.061				
	(0.084)				
Bank-industry FE	N	N	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	N	Y	Y	Y	Y
N	80,973	80,973	80,973	17,565	80,973

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. In Panels A and B, the sample comprises the years 1990 to 2013. In Panel C, we use the final regression sample from 1997 to 2013 (for which we are able to observe supplier and customer industries from BEA data). Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least three (two) half-years in Panels A and B (Panel C), whereas the remaining periods are included as zero-loan observations. In Panels A and C, the dependent variable in the first three columns is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. In the fourth column, the dependent variable is the logged average size of loans granted to industry i by bank j in period t, and the sample is limited to non-zero loans granted to industry i by bank j in period t. In Panels A and C, the dependent variable in the fifth column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. For all dependent variables in Panel B, we additionally exclude the volume of all loans granted to firms

in industry i to which bank j already lent anytime from $t-13$ to $t-2$ (relationship loans). As a result, we also drop observations in which all loans to industry i consist entirely of relationship loans. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 3: **Industry Propensity to Fire Sales and Bank Lending to Industries in Distress**

Specificity measure	ln(1+Loan vol.)	Any loan	ln(1+Loan vol.)	Any loan
	Low asset redeployability		High M&E/assets	
	(1)	(2)	(3)	(4)
Market share × Ind. distress × Specific	8.266***	0.372***	4.837**	0.230*
	(2.009)	(0.107)	(2.387)	(0.122)
Market share × Industry distress	1.029	0.065	0.532	0.026
	(1.146)	(0.056)	(0.895)	(0.043)
Market share × Specific	0.919	0.016	-3.269	-0.108
	(2.542)	(0.133)	(2.522)	(0.119)
Market share	-0.864	-0.055	-0.659	-0.076
	(1.494)	(0.073)	(2.297)	(0.112)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	80,973	80,973	74,666	74,666

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable in the first and third column is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. The dependent variable in the second and fourth column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. In the first two columns, *Specific*$_i$ is is an indicator for whether industry i is among the bottom 20% industries in terms of asset redeployability, as defined in Kung and Kim (2016). In the last two columns, *Specific*$_{it}$ is an indicator for whether industry i is among the top 20% industries in terms of its ratio of machinery and equipment to total assets in year t. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 4: **Bank Lending to Distressed Industries' Suppliers**

Sample	ln(1+Loan volume) All	ln(Avg. loan size) Loan volume $\neq 0$	Any loan All	ln(1+Loan volume) All	Any loan All
	(1)	(2)	(3)	(4)	(5)
Customer share × Customer distress	3.065***	-0.199	0.148***	3.070***	0.148***
	(1.144)	(0.430)	(0.052)	(1.140)	(0.052)
Customer share	2.086	0.291	0.079	2.046	0.078
	(2.173)	(0.310)	(0.098)	(2.100)	(0.095)
Market share × Industry distress				2.603	0.130
				(2.127)	(0.105)
Market share				-0.742	-0.057
				(2.039)	(0.103)
Bank-industry FE	Y	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y	Y
N	51,534	12,530	51,534	51,516	51,516

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable in the first and fourth column is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. In the second column, the dependent variable is the logged average size of loans granted to industry i by bank j in period t, and the sample is limited to non-zero loans granted to industry i by bank j in period t. The dependent variable in the third and fifth column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. *Customer share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume in industry i's customer industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Customer distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's customer industry was less than -10% in the previous half-year $t-1$. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to (supplier) industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of (supplier) industry i was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 5: **Bank Lending to Distressed Industries' Customers**

Sample	ln(1+Loan volume) All	ln(Avg. loan size) Loan volume $\neq 0$	Any loan All	ln(1+Loan volume) All	Any loan All
	(1)	(2)	(3)	(4)	(5)
Supplier share × Supplier distress	2.289*	0.028	0.116**	2.008	0.103*
	(1.170)	(0.359)	(0.057)	(1.241)	(0.059)
Supplier share	-0.075	-0.362	-0.018	-0.148	-0.020
	(2.399)	(0.225)	(0.115)	(2.257)	(0.109)
Market share × Industry distress				3.880**	0.188**
				(1.666)	(0.083)
Market share				-0.538	-0.044
				(2.268)	(0.116)
Bank-industry FE	Y	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y	Y
N	46,228	11,071	46,228	46,210	46,210

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable in the first and fourth column is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. In the second column, the dependent variable is the logged average size of loans granted to industry i by bank j in period t, and the sample is limited to non-zero loans granted to industry i by bank j in period t. The dependent variable in the third and fifth column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's supplier industry was less than -10% in the previous half-year $t-1$. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to (customer) industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of (customer) industry i was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 6: **Bank Lending to Distressed Industries' Suppliers and Customers: Relationship Industries**

	ln(1+Loan volume)	Any loan	ln(1+Loan volume)	Any loan
	(1)	(2)	(3)	(4)
Customer share × Customer distress × Relationship industries	7.475**	0.389**		
	(3.075)	(0.160)		
Customer share × Customer distress	1.399	0.060		
	(1.523)	(0.070)		
Customer share × Relationship industries	-1.769	-0.125		
	(3.178)	(0.151)		
Customer share	2.735	0.124		
	(3.088)	(0.142)		
Supplier share × Supplier distress × Relationship industries			6.230*	0.265*
			(3.275)	(0.155)
Supplier share × Supplier distress			-0.213	0.010
			(1.584)	(0.072)
Supplier share × Relationship industries			-2.148	-0.112
			(2.182)	(0.114)
Supplier share			0.621	0.018
			(2.712)	(0.131)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	51,534	51,534	46,228	46,228

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable in the first and third column is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. The dependent variable in the second and fourth column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. *Customer share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume in industry i's customer industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Customer distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's customer industry was less than -10% in the previous half-year $t-1$. *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's supplier industry was less than -10% in the previous half-year $t-1$. *Relationship industries*$_i$ is an indicator for whether industry i and its customer or supplier industries are relationship industries, as defined in Cremers, Nair, and Peyer (2008). Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 7: **Bank Lending to Industries in Distress: First Stage**

	Market share	Market share × Ind. distress	Customer share	Customer share × Cust. distress	Supplier share	Supplier share × Supp. distress
	(1)	(2)	(3)	(4)	(5)	(6)
Merger-implied market share × Ind. distress	0.039**	0.502***				
	(0.019)	(0.098)				
Merger-implied market share	0.466***	0.016				
	(0.065)	(0.017)				
Merger-implied customer share × Cust. distress			0.037**	0.780***		
			(0.017)	(0.081)		
Merger-implied customer share			0.507***	-0.015		
			(0.027)	(0.013)		
Merger-implied supplier share × Supp. distress					0.087**	0.797***
					(0.039)	(0.104)
Merger-implied supplier share					0.516***	-0.019***
					(0.090)	(0.007)
Bank-industry FE	Y	Y	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y	Y	Y
F-statistic	28.09	32.77	315.02	87.87	182.68	33.71
N	60,206	60,206	35,377	35,377	31,590	31,590

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to banks that merged with one another anytime during the sample period. The dependent variable is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. *Merger-implied market share*$_{ijt}$ is equal to 0 until (but excluding) the period t when a merger between bank j and another bank is completed, and equal to the sum of the two merging banks' market shares in industry i in $t-2$ thereafter. *Customer share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume in industry i's customer industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Customer distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's customer industry was less than -10% in the previous half-year $t-1$. *Merger-implied customer share*$_{ijt}$ is equal to 0 until (but excluding) the period t when a merger between bank j and another bank is completed, and equal to the two merging banks' market shares in industry i's customer industry in $t-2$ thereafter. *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's supplier industry was less than -10% in the previous half-year $t-1$. *Merger-implied supplier share*$_{ijt}$ is equal to 0 until (but excluding) the period t when a

merger between bank j and another bank is completed, and equal to the two merging banks' market shares in industry i's supplier industry in $t-2$ thereafter. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 8: **Bank Lending to Industries in Distress: Instrumental-variable Estimates**

	ln(1+Loan volume)		
	(1)	(2)	(3)
Market share × Industry distress (instrumented)	4.888*		
	(2.626)		
Market share (instrumented)	-18.516***		
	(4.885)		
Customer share × Customer distress (instrumented)		2.564	
		(1.834)	
Customer share (instrumented)		12.619***	
		(3.567)	
Supplier share × Supplier distress (instrumented)			2.785*
			(1.449)
Supplier share (instrumented)			5.669*
			(2.913)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	60,206	35,377	31,590

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to banks that merged with one another anytime during the sample period. The dependent variable is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. We instrument this variable by a measure that is equal to 0 until (but excluding) the period t when a merger between bank j and another bank is completed, and equal to the sum of the two merging banks' market shares in industry i in $t-2$ thereafter. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. *Customer share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume in industry i's customer industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. We instrument this variable by a measure that is equal to 0 until (but excluding) the period t when a merger between bank j and another bank is completed, and equal to the two merging banks' market shares in industry i's customer industry in $t-2$ thereafter. *Customer distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's customer industry was less than -10% in the previous half-year $t-1$. *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. We instrument this variable by a measure that is equal to 0 until (but excluding) the period t when a merger between bank j and another bank is completed, and equal to the two merging banks' market shares in industry i's supplier industry in $t-2$ thereafter. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's supplier industry was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 9: **Bank Lending to Shocked Industries' Customers: Relative Leverage**

Sample	ln(1+Loan volume) All	ln(Avg. loan size) Loan volume $\neq 0$	Any loan All
	(1)	(2)	(3)
Supp. share × Supp. distress × Relative leverage	4.187***	0.334	0.204***
	(1.406)	(0.339)	(0.074)
Supplier share × Supplier distress	-2.949*	-0.500	-0.131
	(1.714)	(0.641)	(0.091)
Supplier share × Relative leverage	2.206*	-0.199	0.096
	(1.160)	(0.324)	(0.062)
Supplier share	-0.977	-0.152	-0.054
	(3.868)	(0.560)	(0.188)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	43,476	10,493	43,476

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable in the first column is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. In the second column, the dependent variable is the logged average size of loans granted to industry i by bank j in period t, and the sample is limited to non-zero loans granted to industry i by bank j in period t. The dependent variable in the third column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of i's supplier industry was less than -10% in the previous half-year $t-1$. *Relative leverage*$_{it}$ is the ratio between the average leverage of industry i's (distressed) supplier industry and the average leverage of industry i in period t. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 10: **Bank Lending to Distressed Industries' Customers: Customer vs. Supplier HHI**

	ln(1+Loan volume)	ln(Avg. loan size)	Any loan
Sample	All	Loan volume $\neq 0$	All
Panel A: Importance of customers for their suppliers			
	(1)	(2)	(3)
Supp. share × Supp. distress × Customer HHI	10.971**	-3.838**	0.584**
	(5.445)	(1.582)	(0.268)
Supplier share × Supplier distress	0.852	0.566	0.037
	(0.977)	(0.397)	(0.053)
Supplier share × Customer HHI	3.744	2.239**	-0.100
	(9.573)	(0.977)	(0.490)
Supplier share	-0.667	-0.671***	-0.004
	(2.794)	(0.224)	(0.139)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	46,228	11,071	46,228
Panel B: Importance of suppliers for their customers			
	(1)	(2)	(3)
Supp. share × Supp. distress × Supplier HHI	-18.970***	-3.637***	-0.875**
	(7.181)	(1.005)	(0.366)
Supplier share × Supplier distress	6.329***	0.826**	0.302***
	(2.051)	(0.413)	(0.105)
Supplier share × Supplier HHI	-6.898	3.409***	-0.478*
	(5.870)	(1.097)	(0.279)
Supplier share	1.520	-1.119***	0.092
	(3.116)	(0.328)	(0.144)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	46,228	11,071	46,228

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable in the first column is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. In the second column, the dependent variable is the logged average size of loans granted to industry i by bank j in period t, and the sample is limited to non-zero loans granted to industry i by bank j in period t. The dependent variable in the third column is an indicator capturing whether *any* loans were granted to industry i by bank j in period t. *Supplier share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's supplier industry over the aggregate loan volume in industry i's supplier industry, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of i's supplier industry was less than -10% in the previous half-year $t-1$. *Customer HHI*$_{it}$ measures the sales concentration of industry i as customers to their (distressed) suppliers in period t. *Supplier HHI*$_{it}$ measures the sales concentration of (distressed) suppliers to industry i in period t. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 11: **Distressed Industries' Shares in Banks' Loan Portfolios**

	ln(1+Loan volume)		
	(1)	(2)	(3)
Portfolio share of industry × Industry distress	-1.831***		
	(0.609)		
Portfolio share of industry	-0.448		
	(0.375)		
Portfolio share of supplier × Supplier distress		0.191	
		(0.904)	
Portfolio share of supplier		0.480	
		(0.715)	
Portfolio share of customer × Customer distress			-0.505
			(1.809)
Portfolio share of customer			1.316
			(0.953)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	71,983	41,845	46,607

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to bank-industry (ij) pairs with non-zero loans in at least two half-years, whereas the remaining periods are included as zero-loan observations. The dependent variable is the logarithm of the total volume of all loans granted to industry i by bank j in period t plus one. *Portfolio share of industry*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume granted by bank j, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. *Portfolio share of supplier*$_{ijt-2}$ is the proportion of bank j's total loan volume to i's supplier industry over the aggregate loan volume granted by bank j, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Supplier distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's supplier industry was less than -10% in the previous half-year $t-1$. *Portfolio share of customer*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i's customer industry over the aggregate loan volume granted by bank j, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Customer distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i's customer industry was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 12: **Impact on Cost of Debt**

	ln(Spread)	ln(TCB)	ln(Spread)	ln(TCB)
Horizon	After 12 months		After 24 months	
Sample	Loan volume $\neq 0$			
	(1)	(2)	(3)	(4)
Market share × Industry distress	0.033	0.057	0.002	-0.119
	(0.139)	(0.398)	(0.139)	(0.272)
Market share	0.102	0.441**	0.143	0.419**
	(0.218)	(0.168)	(0.243)	(0.161)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	16,160	6,635	14,998	6,104

Notes: The unit of observation is the bank-industry-half-year level ijt, based on the sample of all completed syndicated loans granted to industry i for which bank j served as a lead arranger in half-year t. Furthermore, the sample is limited to periods with non-zero loans granted to industry i by bank j. The dependent variable in the first and third column is the logged average all-in-drawn spread of all loans granted to industry i by bank j in period $t+1$ (12 months after the industry shock) and in period $t+3$ (24 months after the industry shock), respectively, where the all-in-drawn spread is the sum of the spread over LIBOR and any annual fees paid to the lender syndicate. The dependent variable in the second and fourth column is the logged average total cost of borrowing, as defined in Berg, Saunders, and Steffen (2016), of all loans granted to industry i by bank j in period $t+1$ (12 months after the industry shock) and in period $t+3$ (24 months after the industry shock), respectively. *Market share*$_{ijt-2}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 13: **Industry-wide Credit Concentration and Firm Exit**

	Any bankruptcy-related delisting in industry					
Horizon	After 6 months			After 12 months		
HHI measure	All banks		Top 1	All banks		Top 1
	(1)	(2)	(3)	(4)	(5)	(6)
Market HHI × Ind. distress	-0.409**	-0.341**	-0.218	-0.403**	-0.346***	-0.268**
	(0.161)	(0.151)	(0.144)	(0.166)	(0.130)	(0.134)
Market HHI	-0.642***	-0.016	-0.064	-0.646***	-0.010	-0.044
	(0.151)	(0.084)	(0.095)	(0.150)	(0.082)	(0.093)
Industry distress	0.197***	0.131***	0.137**	0.199***	0.133***	0.153***
	(0.045)	(0.041)	(0.053)	(0.045)	(0.035)	(0.049)
Industry FE	N	Y	Y	N	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	2,633	2,633	2,633	2,579	2,579	2,579

Notes: The unit of observation is the industry-half-year level it. Furthermore, the sample is limited to industries with more than 50 non-zero loan observations across all bank relationships over 14 years from 1990 to 2013. The dependent variable is an indicator variable for whether there was any exit in industry i in half-year t (in the first three columns) or $t+1$ (in the last three columns). We use the following CRSP delisting codes to identify exits: any type of liquidation (400-490); price fell below acceptable level; insufficient capital, surplus, and/or equity; insufficient (or non-compliance with rules of) float or assets; company request, liquidation; bankruptcy, declared insolvent; delinquent in filing; non-payment of fees; does not meet exchange's financial guidelines for continued listing; protection of investors and the public interest; corporate governance violation; and delist required by Securities Exchange Commission (SEC). *Market HHI*$_{it-2}$ measures the credit concentration in industry i over twelve half-year periods (i.e., six years) from $t-13$ to $t-2$, across all banks that provide credit to industry i (in all columns but the third and sixth column). In columns 3 and 6, the measure of concentration is the market share of the top lender to industry i from $t-13$ to $t-2$. *Industry distress*$_{it-1}$ is an indicator variable for whether the cumulative average stock return of industry i was less than -10% in the previous half-year $t-1$. Public-service, energy, and financial-services industries are dropped. Robust standard errors, clustered at the industry level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 14: **Credit Concentration and Long-run Abnormal Returns of Industries following Distress**

Alpha (in % per month)	Top-quintile credit concentration	Bottom-quintile credit concentration	Long-short
Three years	-0.858***	-1.127***	0.336**
	(0.170)	(0.129)	(0.158)
N	288	287	287
Five years	-0.812***	-1.048***	0.288**
	(0.158)	(0.122)	(0.133)
N	288	287	287
Seven years	-0.775***	-0.978***	0.243**
	(0.157)	(0.117)	(0.119)
N	288	287	287

Notes: Fama and French (1993) three-factor-model calendar-time portfolio estimates of alpha (in percent per month) are based on weighted-least-squares (WLS) regressions from 1990 to 2013 of the monthly premium of a given portfolio relative to the one-month Treasury rate (as dependent variable) on the monthly market premium, small minus big market capitalization excess return, and high minus low book-to-market ratio excess return. We form equal-weight portfolios of industries that in the past n years, where n varies from three to five and seven (across rows), had a cumulative average stock return of less than -10% in the previous half-year, and were in the top (first column) or bottom (second column) quintile of the distribution in terms of the industry-level credit concentration over six years prior to industry distress across all banks in a given industry (see definition of *Market HHI*$_{it-2}$ in Table 13). In the last column, long-short portfolios are long in the top quintile of said distribution and short in the bottom quintile. N is the number of months with non-empty portfolios. Observations are weighted efficiently as a function of the number of industries in a given portfolio in month t, as in Malmendier, Opp, and Saidi (2016). Robust standard errors are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.